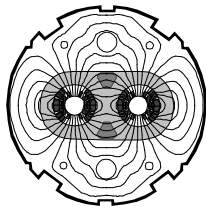


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the
**Large
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Collider**
project

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Interface Specification

INNER TRIPLET CORRECTOR MCBX/MCBXA

Abstract

MCBX and MCBXA corrector packages are mated with MQXA and MQXB quadrupoles in the LMQXA, LMQXB, and LMQXC assemblies. This specification codifies the envelope and attachments which constrain the MCBX deliverable such that the attachment can be completed.

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History of Changes

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0.1	2002-03-05	All	First submitted
	2002-04-15	All	Submission for approval
1.0	2002-08-19	8	Changed "4 600 A leads" to "four 600 A leads". Changed "4 120 A leads" to "four 120 A leads".
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1. INTRODUCTION

Each inner triplet of LHC [1] is assembled from a set of components, including the main quadrupole elements MQXA and MQXB, and corrector elements MCBX, MCBXA, and MQSXA (figure 1). The MCBX, MCBXA and MQSXA corrector packages are incorporated into the LMQX helium vessels, and operate in a 1.9K helium bath that surrounds the corrector and is contained by a separate cylinder.

The MCBXA corrector consists of an MCBX assembly [2], with 2 additional windings inserted into the bore or the dipole.

MCBXT and MCBXS magnets are used in the 1st two assemblies of LQXB, as described in [3]. These magnets are shorter than the standard MCBX assembly, and have been reworked such that the electrical and alignment interfaces are compatible with standard LQXB assembly.

The correctors are procured by CERN, and delivered fully tested to Fermilab for final assembly with the main quadrupoles.

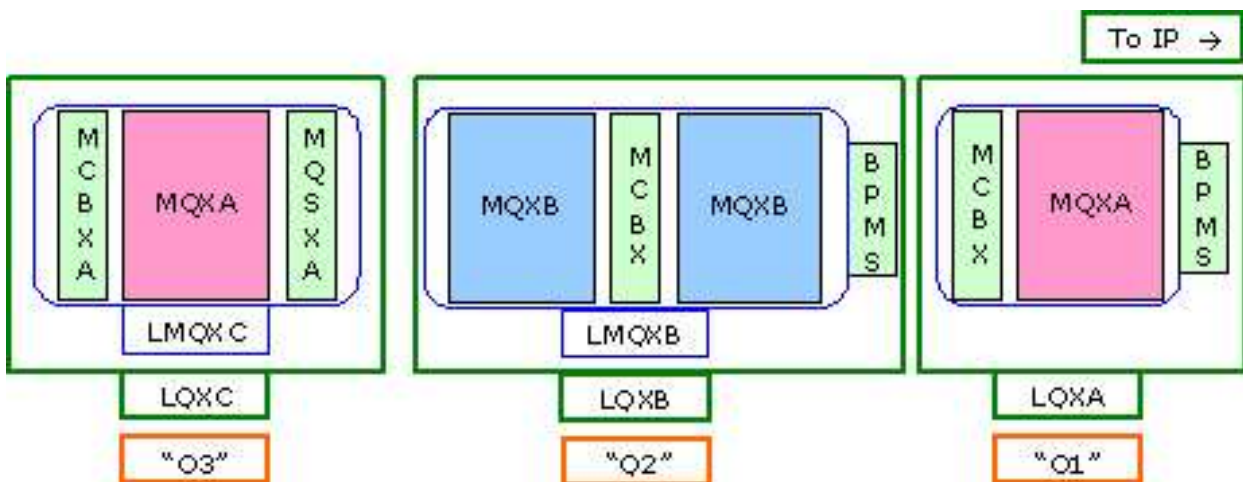


Figure 1. Layout of one side of an interaction point showing assembly packages

2. MCBX/MCBXA INTERFACES

2.1 MECHANICAL

The MCBX (or MCBXA) corrector package has a mechanical envelope and mass as defined in Figures 2 (longitudinal section), 3 (transverse section) and 4 (view from lead, i.e. non-flange end). Figure 2 indicates the overall length, including the bus connection brackets, the thickness of the mounting flange, the positions of lifting holes, and the alignment scribe line (see Section 2.3). Figure 3 shows the diameters of the coil bore (without the higher order corrector layers that are included with the MCBXA), the magnet outer shell, and the mounting flange. It also shows the dimensions of four 55mm slots in the flange that allow the passage of bus work from the adjacent quadrupole, and the 8 mounting holes in the mounting flange which allow the magnet to be attached to the proper magnet in the triplet. Figure 4 shows the alignment scribe line, and the bus connection brackets for the vertical and horizontal dipole layers. This envelope is consistent with the volume provided in the LMQX assemblies, and the flange shown on the non-lead end of the corrector outer cylinder mates with the attachment element which will be used to connect the corrector to either the LMQXA, LMQXB, or LMQXC assemblies. The mass of the MCBX is approximately 485 kg. For the MCBXS and MCBXT, the mechanical features and mass are defined in [4] and [5].

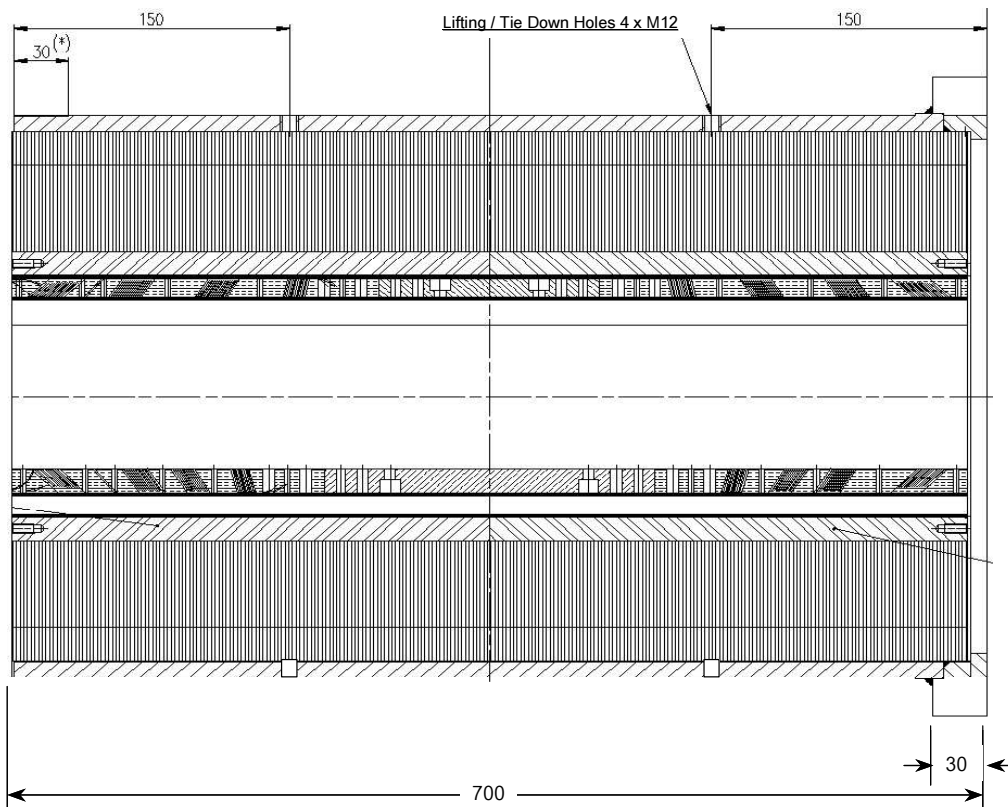


Figure 2. MCBX longitudinal section. The mark (*) indicates the alignment scribe line (see Section 2.3).

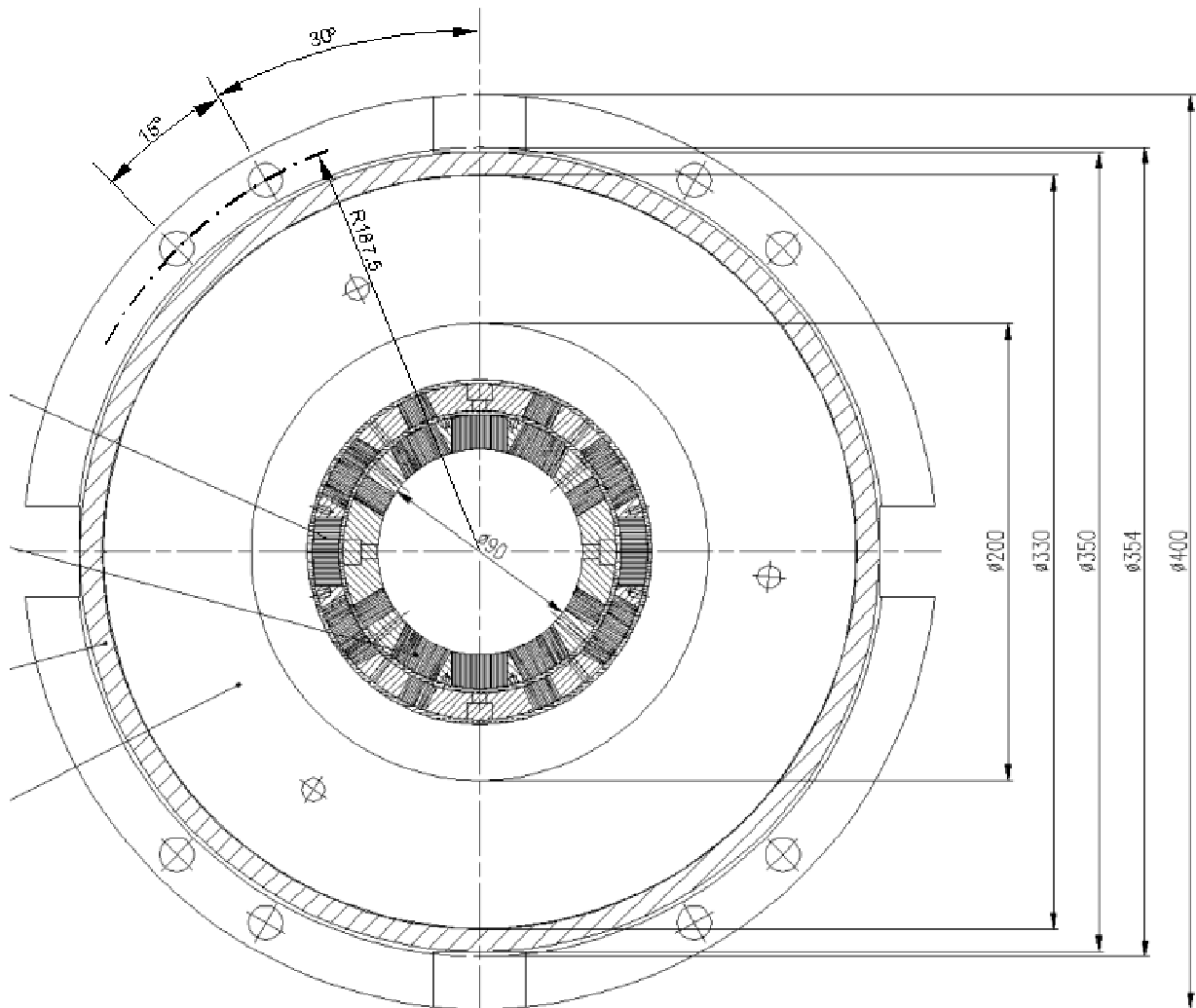


Figure 3. MCBX transverse section. The eight mounting holes are 15 mm diameter.

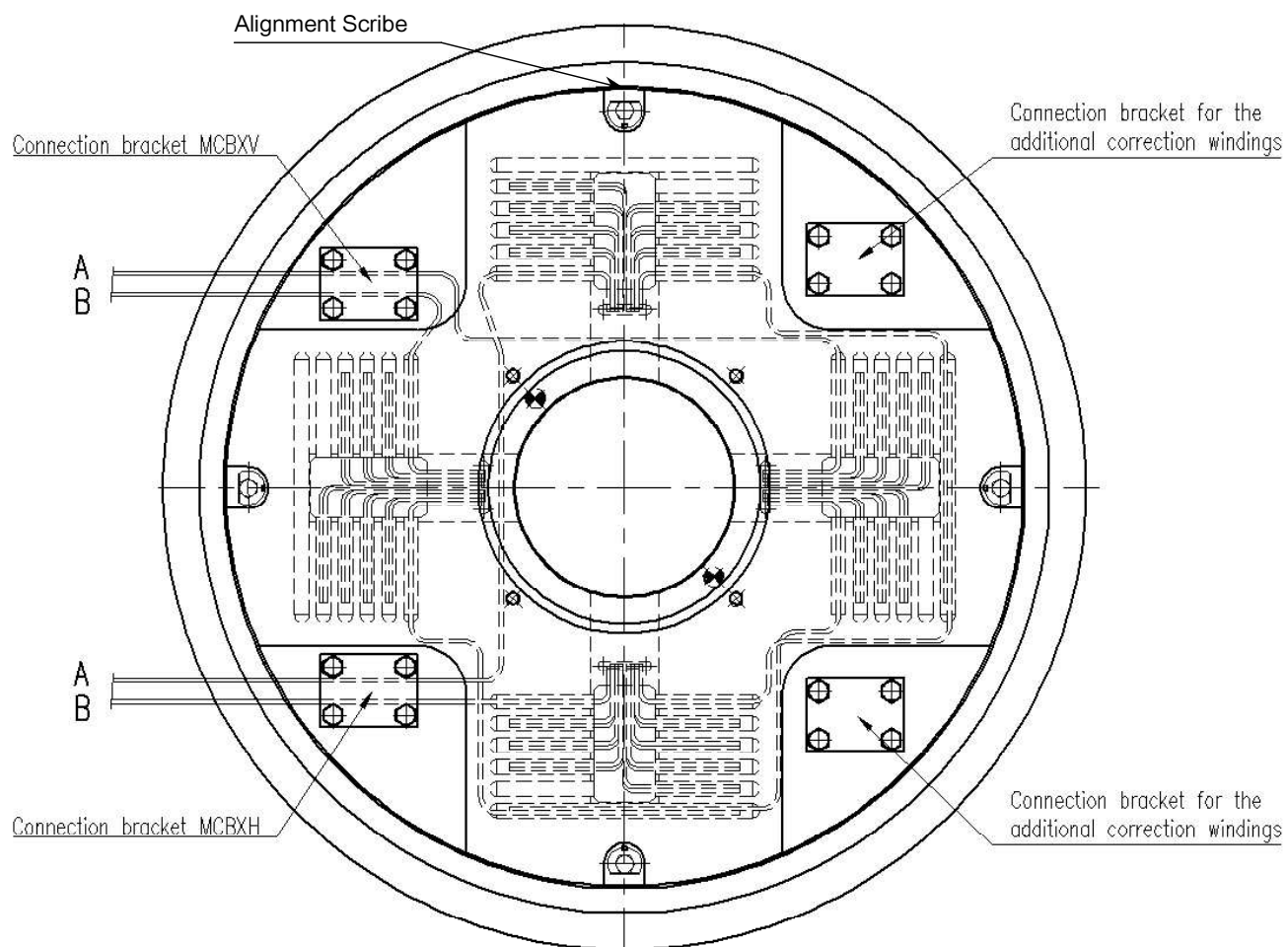


Figure 4. MCBX lead end view.

2.2 ELECTRICAL

The MCBX is provided to Fermilab with four 600A leads extending from the lead end of the package; the MCBXA is provided to Fermilab with four 600A leads for the dipole layers and four 120A leads for the additional layers. CERN will provide the leads out to the current lead connection bracket attached to each unit (see Fig. 4). The leads are labelled A and B, in accordance with CERN standard [6].

Each layer of the correctors come with a single voltage tap attached to the A lead. The corrector unit will be delivered with 10m of 26 gauge wire for each of these taps [7].

There are no temperature sensors or quench heaters associated with these units.

2.3 ALIGNMENT

Alignment information for the dipole layers is transmitted in rotation by use of a scribe line located at the non-flange end of the assembly, which is located on the vertical centerline of the magnet. For position of the axis, the outer cylinder of the corrector element is concentric with the beam axis. In the case of the MCBXA, CERN aligns the extra layers with respect to the dipole layers.

3. REFERENCES

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- [6] LHC MAGNET POLARITIES, CERN Specification LHC-DC-ES-0001.
- [7] INSTRUMENTATION WIRES, CONNECTION TECHNIQUES AND FEEDTHROUGHS FOR THE LHC CRYOMAGNETS AND THE QRL, CERN Specification LHC-QI-ES-0001.